UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF IDAHO

UNITED STATES
V.
ASARCO INCORPORATED, ET AL.
NO. 96-0122-N-EJL

SUPPLEMENTAL EXPERT REPORT OF
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November 9, 2004
SC10536

1. Introduction

This supplemental expert report provides updated calculations of natural resource damages for federal lands using the service replacement cost methodology. This update reflects the Trustees' decision not to seek damages for injuries to natural resources in two locations, Government Gulch and Deadwood Gulch. In addition, this supplemental expert report discusses potential overlap in aquatic and riparian services that could be generated from implementation of certain service replacement alternatives described in the expert reports of Lipton et al. (2004) and LeJeune et al. (2004).

Dr. Katherine LeJeune is responsible for Section 2 of this report. Dr. LeJeune, Dr. Joshua Lipton, and Mr. David Chapman are responsible for Section 3 of the report. Information regarding the background, qualifications, and compensation of these authors is provided in previous expert reports.

2. Damage Calculation for Upper Basin Federal Lands — Updated Injured Acreage

The riparian federal land damage claim was updated from LeJeune et al. (2004) to reflect the Trustees' decision not to seek damages to resources on Government Gulch (1.94 ac) and Deadwood Gulch (0.78 ac). A total of 117.7 ac of upper basin federal land is now quantified as injured (Table 1).

Table 2 presents the numbers of acres of each of the replacement actions necessary to restore lost services to baseline and to compensate for interim losses in South Fork Coeur d'Alene River, Canyon Creek, and Ninemile Creek. Table 2 updates the values originally presented in Table 6.3 of LeJeune et al. (2004).

Table 3 presents the costs to conduct each of the scaled replacement alternatives to restore injured resources to baseline and compensate for interim losses in the South Fork Coeur d'Alene River, Canyon Creek, and Ninemile Creek. The costs vary from $3.52 million for conservation easements with natural recovery to $101 million for placer mine site rehabilitation. The dollar amounts shown in Table 3 are the calculated damages for injuries to upper basin federal lands. Table 3 updates the costs originally presented in Table 6.4 of LeJeune et al. (2004).

Table 1. Upper basin federal land parcels with injured habitat used in damages calculation

Parcel number and name	Basin	Acres of injured habitat used in damages calculation	Will it be cleaned up under EPA's ROD for OU3?[a]
34. Below Woodland	Canyon Creek	0.6	No
36. Canyon Creek	Canyon Creek	1.4	No
35. Upper Woodland	Canyon Creek	51.1	No
33. Above Success	Ninemile Creek	0.7	Yes
32. East Fork Ninemile	Ninemile Creek	10.0	No
30. Ninemile Creek	Ninemile Creek	4.9	No
25. BF Polaris	S Fork Coeur d'Alene River	0.8	Yes
26. Evolution	S Fork Coeur d'Alene River	0.6	No
26. Evolution	S Fork Coeur d'Alene River	4.8	Yes
27. Osburn	S Fork Coeur d'Alene River	0.1	Yes
21. SF Elizabeth Park	S Fork Coeur d'Alene River	6.4	Yes
22. SF Roadside Tailing	S Fork Coeur d'Alene River	3.2	No
28. Silverton	S Fork Coeur d'Alene River	2.4	Yes
18. Smelterville Flats	S Fork Coeur d'Alene River	30.6	No
Total acres of injured habitat used in damages calculation		**117.7**	
Subtotal: Injured habitat that will be cleaned up under EPA's OU3 ROD		**15.3**	

a. Previous cleanup actions are described by parcel in Table 3.2 of LeJeune et al. (2004).

Table 2. Acres of alternative riparian habitat replacement actions necessary to offset injuries to federal lands

	Location/basin of injured lands being offset			
Replacement action	S. Fork Coeur d'Alene River	Canyon Creek	Ninemile Creek	Total[a]
Easement with natural recovery	315	461	135	910
Easement with planting	159	232	68	458
Road bed removal	159	232	68	458
Placer mine restoration	159	232	68	458

a. Total may not equal sum of values shown for the three basins because of rounding.

Table 3. Costs to conduct alternative riparian habitat replacement actions (in millions of 2004 dollars)[a]

	Location/basin of injured lands being addressed			
Replacement action	**S. Fork Coeur d'Alene River**	**Canyon Creek**	**Ninemile Creek**	**Total[b]**
Easements with natural recovery[c]	At least $1.22	At least $1.78	At least $0.520	At least $3.52
Easements with planting	$21.5	$31.4	$9.17	$62.0
Road bed removal	$20.1	$29.5	$8.60	$58.2
Placer mine restoration	$35.1	$51.2	$15.0	$101

a. Costs are calculated as the per-acre costs in Chapter 5 of LeJeune et al. (2004) multiplied by the acres of each replacement action necessary from Table 3.
b. Total may not equal sum of values shown for the three basins because of rounding.
c. Work to quantify additional costs associated with acquisition of a conservation easement with natural recovery is ongoing.

3. Potential Overlap in Ecological Services from Replacement Actions

In this section we discuss the potential overlap in aquatic and riparian ecological benefits that could result from replacement projects. For most of the riparian habitat replacement projects, aquatic service benefits that might result from riparian replacement projects are uncertain and possibly minimal. For most of the aquatic habitat replacement projects, however, riparian benefits are likely to be realized. We quantify the riparian benefits that would be expected to result from implementation of aquatic replacement projects. Through this quantification we calculate the amount of residual replacement actions needed for federal land injuries if the aquatic projects are implemented. This quantification ensures that potential overlap in service benefits is accounted for in final damage calculations.

3.1 Potential Aquatic Service Benefits from Riparian Replacement Projects

To evaluate potential aquatic service benefits associated with riparian replacement projects, the aquatic benefits reasonably expected to accrue from each of the four riparian replacement projects were considered.

Conservation easements with natural recovery and with planting may not necessarily provide measurable aquatic benefits. Revegetation of the floodplain, either naturally or through ecological restoration actions, will not necessarily lead to production of greater numbers of fish. The benefit would depend on the current condition of the aquatic habitat and the potential for improvement by canopy restoration. Even for streams with the potential for aquatic habitat improvement with canopy restoration, benefits of canopy restoration projects that require regrowth of large conifers required to shade the stream channel and supply large woody debris that would benefit the aquatic habitat might not be realized for 50 to 100 years, even with active planting (Lipton et al., 2004). Given the uncertainty in the existing condition of the aquatic habitat on potential conservation easement parcels, and the uncertainty of the potential of the aquatic habitat to produce fish, or produce more fish, no aquatic benefits are necessarily expected to accrue from conservation easement projects.

Road and railway bed removal projects for replacement of riparian habitat target roads and railways in the floodplain that do not encroach on the stream channel itself. The alternative presented in LeJeune et al. (2004) was designed to allow natural recovery of vegetation. A similar project described as a potential replacement habitat for aquatic resources includes active planting and soil stabilization to reduce erosion and sedimentation impacts on the adjacent stream channel. Since the projects described for riparian replacement are, by definition, not adjacent to the stream channel, no measurable aquatic benefits are expected to accrue as a result of their implementation.

Placer mine restoration would restore natural hydrologic, geomorphic, and vegetation conditions of the stream corridor and floodplain. Components of the project would include removing wastes and abandoned machinery, recontouring the floodplain to achieve a more natural configuration, replacing soils and sediments to mimic a natural depositional floodplain, reconstructing the stream channel so that it functions as a natural stream, and revegetating the riparian habitat in the floodplain. Therefore, this replacement project type is likely to provide substantial aquatic benefits. For purposes of estimating potential overlap in benefits, 0.75 miles of Sherlock Creek could be addressed through the proposed habitat restoration if aquatic specific elements were added to the project.

3.2 Accounting for Riparian Habitat Service Benefits Generated by Aquatic Habitat Restoration Projects

Several of the aquatic habitat restoration projects include actions that are expected to enhance fisheries production and riparian habitat. **Mainstem bank structures, road and railway bed relocation**, and **channel reconfiguration** alternatives (see Lipton et al., 2004) all include planting riparian vegetation as part of the restoration actions. As described in Lipton et al. (2004), no riparian habitat is created in the **woody debris addition** aquatic habitat restoration action. Below, we describe calculation of the benefits of aquatic habitat projects to riparian habitat, and the resulting reduced amount of riparian habitat restoration required to offset injuries to upper basin federal lands.

The detailed descriptions of the aquatic habitat restoration projects previously presented include the amount of riparian revegetation that will be conducted (Lipton et al., 2004). For mainstem bank structures, 1,000 ft^2 of riparian habitat will be created for each 100 lineal feet of stream where the bank structures are put in place. Road and railway bed relocation will create 3,000 ft^2 of riparian habitat per 100 lineal feet, and channel reconfiguration will create 2,000 ft^2 of riparian habitat per 100 lineal feet. These riparian habitat amounts convert to 1.21 acres/mile, 3.63 acres/mile, and 2.42 acres/mile, respectively. Thus, for example, for every mile of mainstem bank structure implemented to address aquatic habitat restoration needs, 1.21 acres of riparian habitat will be created.

To determine the amount of riparian habitat credit generated by these aquatic habitat restoration actions, the timing of riparian habitat benefit accrual must be considered. Lipton et al. (2004) estimated that it will take up to 10 years to implement all of the aquatic habitat restoration projects (including the riparian revegetation components of the projects). LeJeune et al. (2004) estimated that full riparian habitat services are expected to be reached approximately 40 years after active replanting is completed. We used these project implementation and service trajectory assumptions to conduct a HEA credit calculation that is specific to the riparian habitat created by the aquatic habitat restoration projects.

The HEA shows that each acre of each of the aquatic habitat restoration projects generates 13.15 acre-years of riparian habitat credit. In comparison, three of the riparian habitat projects described in LeJeune et al. (2004) generate 15.16 acre-years of credit per acre of project: conservation easement with planting, road removal, and placer mine site rehabilitation. The fourth riparian habitat project type, conservation easement without planting, generates 7.63 acre-years of credit per acre (less credit is generated by this restoration action because it takes much longer for habitat services to reach full services). Therefore, each acre of riparian habitat created by the aquatic habitat restoration projects generates slightly less credit than three of the four riparian restoration projects (13.15/15.16), and nearly twice as much credit as the conservation easement without planting project (13.15/7.63). The differences in the amount of credit generated by the different projects are a function of the timeframe over which the increase in riparian habitat services occurs.

We used the results of the HEA credit calculations to calculate how many fewer acres of riparian habitat projects are needed if aquatic projects with collateral riparian benefits are implemented. For conservation easement with planting, road removal, or placer mine site rehabilitation, each acre of riparian habitat created as part of an aquatic project reduces the acreage needed by 0.87 acres (13.15/15.16). For conservation easement with no planting, each acre of riparian habitat created in the aquatic projects reduces the acreage needed by 1.72 acres (13.15/7.63). These conversion factors of 0.87 or 1.72 are then multiplied by the total amount of riparian habitat created as a part of the aquatic habitat projects to determine the appropriate decrease in the amount of riparian habitat project that is required.

For example, 28.9 miles of channel reconfiguration is necessary to offset aquatic habitat losses on medium streams (Lipton et al., 2004). As a result of the aquatic habitat restoration on 28.9 miles of stream, 70 acres of riparian habitat will be created (28.9 mile x 2.42 acres/mile). Implementation of 28.9 miles of channel reconfiguration would reduce the amount of conservation easement with planting, road removal, or placer mine site rehabilitation by 61 acres (70 acres x 0.87), or the amount of conservation easement with no planting by 120 acres (70 x 1.72).

Table 4 presents the acres of riparian service benefits that would be provided by each of the aquatic service replacement projects presented in Lipton et al. (2004). Implementation of these projects at the scale identified in Table 4.17 of Lipton et al. (2004) would reduce the amount of riparian replacement required by the number of acres shown in the table. For example, 28.9 miles of medium stream replacement projects are necessary to compensate for injuries to Canyon and Ninemile Creeks, assuming a 10-year implementation period (Table 4.17 of Lipton et al., 2004). If road/railway bed relocation projects are implemented on medium streams, the amount of riparian restoration that is required to compensate for injuries to federal lands can be reduced by 91 acres (or 180.7 acres for easements plus natural recovery because of the longer recovery period; Table 4).

Table 5 presents the cost reduction that could result from the riparian credits presented in Table 4. For example, for the road/railway medium sized stream projects discussed above, federal lands damages would be reduced from the replacement cost damages presented in Table 3 by approximately $0.7 million to $10 million, depending on the riparian habitat replacement project that is selected. If the scale of aquatic replacement differs from the amounts presented in Table 4.17 of Lipton et al. (2004), the amount of cost reduction from federal lands damages would differ from the values provided in Table 5. Similarly, selection of a mixture of aquatic project types (as opposed to implementation of just a single project type) would result in different riparian benefits being generated. Regardless, the benefits can be calculated readily for any project mix using the methods described above.

Table 4. Acres of riparian credit provided by implementation of aquatic replacement projects. The calculated riparian credit generated assumes implementation of aquatic projects at the scale identified in Table 4.17 of Lipton et al. (2004), for the 10-year implementation scenario. Riparian credits vary by riparian replacement project type because of different recovery rates.

Aquatic habitat project	**Riparian habitat project**			
	Road bed removal	**Easement + planting**	**Easement + natural recovery**	**Placer mine restoration**
Compensation for Ninemile + Canyon Creek				
Road/railway relocation: small streams	227.5	227.5	452.0	227.5
Road/railway relocation: medium streams	91.0	91.0	180.7	91.0
Woody debris: small streams	0	0	0	0
Woody debris: medium streams	0	0	0	0
Channel reconfiguration	60.6	60.6	120.4	60.6
Compensation for South Fork Coeur d'Alene River				
Mainstem bank structure: large river	25.0	25.0	49.6	25.0
Woody debris: large river	0	0	0	0

The above analyses assume that service replacement is provided through a single project type (e.g., compensation for Ninemile/Canyon Creek service losses through implementation of woody debris projects only). However, implementation of a mix of project types would be more appropriate to providing benefits on a broad landscape scale that considers longitudinal connectivity of different streams and the restoration of heterogeneous habitats to provide benefits to multiple age classes of fish. Selection of a project mix therefore should consider different project types as well as relative cost. Table 6 presents an example of a reasonable mix of projects and associated costs designed to compensate for aquatic injuries (projects and costs are based on Lipton et al., 2004). This project mix is based on selecting a mixture of woody debris addition, road relocation, and channel reconfiguration projects as compensation for Canyon/Ninemile Creeks. For the woody debris/road relocation project types, the lower cost project implementation — medium stream implementation — is selected. A 1:1:1 mix of the three project types is then selected. As compensation for the South Fork Coeur d'Alene River (SFCDR), a mixture of woody debris and bank structure projects is selected, at a 3:1 ratio approximately equivalent to the inverse relative cost.

Table 7 presents the riparian cost "savings" for implementation of the above project mix.

Table 5. Cost savings (2004$) from federal land replacement damages provided by implementation of aquatic replacement projects. The calculated cost savings assumes implementation of aquatic projects at the scale identified in Table 4.17 of Lipton et al. (2004).

	Riparian habitat project			
Aquatic habitat project	**Road bed removal**	**Easement + planting**	**Easement + natural recovery**	**Placer mine restoration**
Compensation for Ninemile + Canyon Creek				
Road/railway relocation: small streams	$28,903,159	$30,801,799	$1,747,428	$50,278,833
Road/railway relocation: medium streams	$11,553,268	$12,312,199	$698,488	$20,097,625
Woody debris: small streams	$0	$0	$0	$0
Woody debris: medium streams	$0	$0	$0	$0
Channel reconfiguration	$7,702,179	$8,208,133	$465,659	$13,398,416
Compensation for South Fork Coeur d'Alene River				
Mainstem bank structure: large river	$3,171,485	$3,379,819	$191,742	$5,516,995
Woody debris: large river	$0	$0	$0	$0

Table 6. Mixture of aquatic service replacement projects and project costs: Canyon + Ninemile Creek

	Woody debris addition: small stream	**Woody debris addition: medium stream**	**Road relocation: small stream**	**Road relocation: medium stream**	**Channel reconfiguration**
Percent allocation by project type	0%	33%	0%	33%	33%
Cost ($2004)	$0	$11,320,661	$0	$10,937,730	$24,641,956
Total cost ($2004)	$46,900,347				

Table 7. Cost savings (2004$) from federal lands replacement damages provided by implementation of aquatic replacement projects at the project mix shown in Table 6. The calculated cost savings assumes implementation of aquatic projects at the scale identified in Table 4.17 of Lipton et al. (2004).

	Riparian habitat project			
Aquatic habitat project	**Road bed removal**	**Easement + planting**	**Easement + natural recovery**	**Placer mine restoration**
Compensation for Ninemile + Canyon Creek				
Road/railway relocation: small streams	$0	$0	$0	$0
Road/railway relocation: medium streams	$3,850,704	$4,103,656	$232,806	$6,698,538
Woody debris: small streams	$0	$0	$0	$0
Woody debris: medium streams	$0	$0	$0	$0
Channel reconfiguration	$2,567,136	$844,955	$47,935	$1,379,249
Compensation for South Fork Coeur d'Alene River				
Mainstem bank structure: large river	$792,871	$844,955	$47,935	$1,379,249
Woody debris: large river	$0	$0	$0	$0
Total savings per riparian project type				
	$7,210,712	$7,684,381	$435,946	$12,543,479

Literature Cited

LeJeune, K., D. Chapman, and G. Koonce. 2004. Damages Calculation for Federal Lands: Coeur d'Alene Basin Natural Resource Damage Assessment. Expert Report. United States of America v. ASARCO Inc. et al. No CV96-0122-N-EJL. Prepared for U.S. Department of Justice.

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